deepish canal turning in behind the pillar. *Outer lip* not expanded above, and but little so on the base; strongly furrowed by the spirals of the sculpture. *Pillar* short, stoutish, well rounded, fine-edged, obliquely truncate, and sharp-pointed. *Inner lip* a thin glaze on the body, but becoming thicker toward the point of the pillar. H. 0·173. B. 0·04. Penultimate whorl, height 0·02. Mouth, length 0·029, breadth 0·015.

This species seems to be somewhat variable in size, one of the five specimens which represent it being a good deal larger than the rest, with the same number of whorls. Another specimen is more dumpily conical.

It has some resemblance in a general way to *C. metaxa*, della Chiaje, but in that the contour lines are more regularly conical, the spire is not at all scalar, the whorls are convexly rounded, there is no deep sutural furrow, the tuberculations are long across the shell, and each whorl has four, not three spirals; the form of the base is a good deal like, but the pillar is shorter, stronger, straighter, rounder, and has not the sharp flanged edge of that species. From *C. tubercularis*, Mont., which it resembles in sculpture, it differs not only in its slender form, but in the absence of the circumcolumnar thread on the base.

Note on an Abnormal (Quadriradiate) Specimen of *Amblypneustes formosus*.

By Prof. F. Jeffrey Bell, M.A., F.R.M.S.

[Read April 15, 1880].

(Plate V.)

It is now forty-three years since that accurate and painstaking zoologist Rudolph Philippi described a monstrous specimen of *Echinus melo* *, which was especially remarkable for the excentric position of the mouth and of the anus, and for the almost complete disappearance of one of the five segments of which the test of every Echinid is typically composed. Being at present engaged in an examination of the group to which the name of Temnopleuridæ has been applied, I have, among others, taken in hand the three specimens of *Amblypneustes formosus*, which, named by Prof. Alex. Agassiz, have come as an earnest of the harvest of the 'Challenger' Expedition. The smallest of these at once arrested my attention by the curious asymmetry which revealed

* Arch. für Naturges. iii. (1837), p. 241, pl. v.

itself even to the touch; when the spines, light green at their base, were removed, I saw, what indeed I had long hoped to see, evidence that even among the regular Echinoidea circumstances may obtain which lead to the incomplete development of that pentamerous arrangement of parts which is the general rule among the Echinodermata. Just, however, as in Dr. Philippi's *Echinus melo*, indications of the fifth segment can be observed on the actinal surface, though they are not so well marked as in that form, for there is, apparently, no representative left of the interambulacral series, and there is not so large a number of ambulacral pores.

Adopting the ordinary mode of orientation of the test, or, in other words, regarding the madreporic plate as being placed in the right anterior interambulacrum *, we find that the abactinal region has been pushed backwards, and that it is some of the parts on the left side of an axis drawn through the median ambulacrum anteriorly and the median interambulacrum posteriorly that have undergone loss. Closer examination reveals the fact that it is here, just as in *Echinus melo*, the left anterior segment or area which has thus suffered: the actinostome has been pushed forwards and to the left. Turning now to the abactinal region, we find that it is composed of ten plates. This is especially interesting, inasmuch as Philippi's specimen presented a tetramerous arrangement of the plates of the abactinal area The two genital plates in the modified area are small, the ocular between them has become considerably enlarged, is obtusely triangular, and has its apex directed downwards. About nine plates down the side of the test the characters of the bare median space alter in character: there is a moderately sized and then a large tubercle; about halfway between these and the regular row of primary tubercles there is, on either side, a sutural line; and the two lines unite above the just-mentioned moderate tubercle; so that, as it seems, a wedge-shaped piece is intercalated into the side of the test; and we have first a large single plate, and then, as is shown by the presence of three primary tubercles on either side, there are three pairs of coronal plates, while on either side of these there are seven pairs of ambulacral pores.

From this description it should be apparent that at a compara-

* The magnificent researches of Lovén confirm the results of earlier Echinologists. "Études sur les Echinoïdes," Kongl. Svenska Vetenskaps-Akad. Hand. Band. ii. no. 7 (1872).

tively early period in its life-history the specimen of *Amblypneustes* now under description met with some powerful external influence, which affected the development of one of its five areæ; the plates that had been formed were, with the growing down of the neighbouring plates towards the actinostome, gradually forced down and off. At the period of its capture some three pairs of complete plates remained to give an indication of its experiences; had its capture been a little delayed, the plates of the fifth segment or area might have been completely forced off; and a specimen which would perhaps have been unique among recent forms would have been collected by the officers of H.M.S. 'Challenger.' What has been prevented here may, however, some day happen. One such test has already been preserved as a fossil. This, fortunately for the credit of science, came into the hands of Hermann von Meyer, who, far from elevating it into a new genus, put on record his belief that it was not even specifically separable from the *Cidarites coronatus* * of Goldfuss. Von Meyer's specimen does not appear to have presented any indications of injury. The chief object of the present communication is to make any other course than such as this extremely difficult. The zoologist who proposes to differentiate a quadriradiate species, on the ground of the absence of one area, will first have to show that the specimens in his hands have not suffered from some accident.

With more or less reason, some naturalists have looked on the possession of other than five rays as a character of some specific value among the Asterida and Ophiurida, and have considered that, on account of its greater rarity among the latter, it is of greater value as a mark of distinction. There is much to be said for this view, but it must not be carried too far; and even without the restrictive influence of Dr. Philippi's abnormal *Echinus melo* and this *A. formosus*, a naturalist would be hardy indeed who would ascribe to a difference in the number of rays of a regular Echinid any other value than that which is justly due to an interesting accident.

Dr. Philippi, indeed, concludes his notice of his monstrous form by saying, "Ueberhaupt scheint bei den regelmässigen Echiniden die Natur nicht selten wenig auf die Symmetrie der einmal vorkommenden Organe zu geben;" and he instances the four anal plates of *Echinocidaris* and the strange elongation of *Echinometra*. As to the former case, on which I will now only

* Nova Acta Leop.-Car. Acad. xviii. i. (1836) p. 287.

make any observation, it may be pointed out that the anal plates are hardly to be compared with any part of the corona or of the genital or ocular plates. The anus is, as Prof. Lovén tells us *, "produit par une résorption locale de la substance calcaire;" even if the anal plates have a deeper morphological significance, they are not so constantly four in *Echinocidaris* as has been ordinarily supposed †.

The pentamerous arrangement of parts in the regular Echinida is, then, only disturbed heretofore in one example‡; information and specimens are, however, at hand to show how this may have happened; the rarity of any divergence from this five-part disposition, in face of the numerous variations which occur in other Echinodermata, will doubtless become more and more important as a factor in determining the genealogical history of the group.

The following are the more important measurements of the specimen (in millims.):—

Diameter.	Height.	Abactinal area.	Anal area.	Actinostome.
13·5	11	3·5	1	5·5

The specimen was collected at Station 162 (off East Moncœur Island; depth 38 to 40 fathoms).

DESCRIPTION OF PLATE V.

Fig. 1. Test, seen from abactinal surface.

2. Test, from actinal surface.

3. Apical area.

The lettering to the above figures applies as follows:—*ia*, interambulacral, *ap*, ambulacral plates; *m*, madreporic plate; *o*, ocular, *g*, genital plates.

For figs. 4, 5, and 6, see Mr. Stewart's paper, *posteà*.

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* "Études sur les Échinoïdes," Kongl. Svensk.Vetensk.-Akad. Handl. ii. no. 7, p. 90.

† Proc. Zool. Soc. London, 1879, p. 436.

‡ [Mr. Stewart's example of an opposite kind of malformation was not known to me when this paper was written.]